Reference sheet/Success story

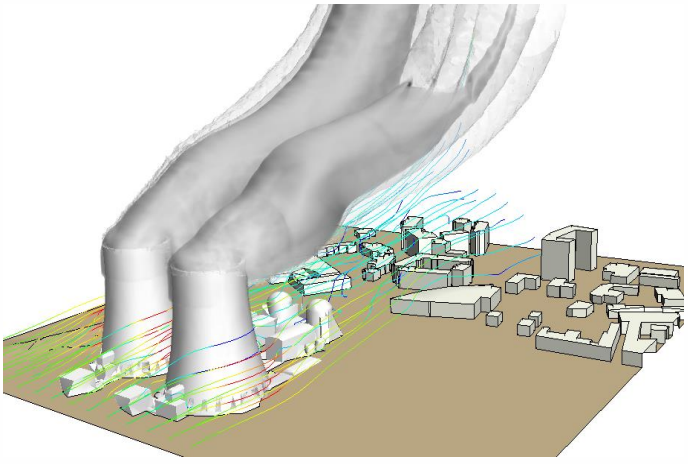
Atmospheric dispersion

Digital simulation of the atmospheric dispersion of polluting gases from a nuclear power plant

Objective

Nuclear power plants must ensure that their possible emissions of toxic products do not exceed the toxicity limits set by regulations. Therefore, in order to anticipate possible exceedances and to optimize protection strategies, rapid and accurate prediction of atmospheric dispersion of polluting gases becomes very important.

For this project, Zelin experts modelled the dispersion of gas on the site of a nuclear power plant according to different climatic scenarios, in order to determine the worst possible configurations and to evaluate the concentration of toxic product at different points of interest.



Result

The results of these simulations provided valuable information from a site security point of view, such as:

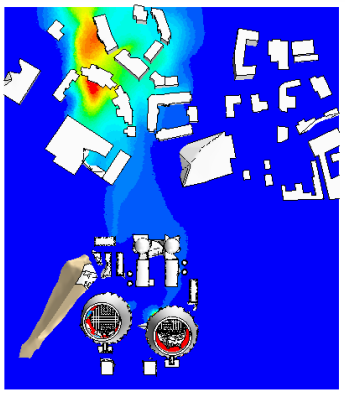
- The wind behavior around the facility.
- The location of contaminant and dispersal accumulation points.
- The concentration of pollutants at different points of interest, and thus the riskiest scenarios.

Finally, the mapping of the toxicity level coupled with the analysis of the wind behavior has enabled us to propose improvement solutions for the safety of the site, in order to comply with the set regulations.

Implementation

Zelin has set up a calculation process that's dedicated to model this type of flow:

- 3D model of the industrial site
- Material resources : HPC cluster (200 cores) & OpenFOAM/StarCCM+ software
- Steady modeling (RANS)
- Passive scalar transport model
- Some analytic examples:
    - Advanced mesh sensitivity (up to 11 million cells)
    - Advanced post-processing: Velocity and temperature fields, pollutant concentration, turbulence intensity, streamlines (line voltage).



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